TMC Pooled-Fund Study 2009 Annual Meeting
Project Proposal Form

Project Category: **Project Number:**

Project Title: Human Factors Guidelines for Transportation Management Centers

Statement of Problem:

Traffic management centers are increasing in number and are receiving significant upgrades to respond to growing congestion in the roadway system. This growth in traffic management activity entails the installation of more and different types of traffic sensor and control systems. The integration of these systems leads to greater dependence on automation and intelligent systems to monitor and process large quantities of data, to assist decision making and to control traffic. In turn, this growing reliance on automation raises human factors issues on how traffic management operators share tasks with automation and what kind of environment is necessary for their work to be effectively completed.

Preliminary Human Factors Guidelines for TMCs were developed in 1999 to incorporate human factors principles to the design and operation of TMCs. For instance, chapters are provided for job design, the user-computer interface, workspace, controls and displays. Sections are also provided on the systems engineering design process. As TMCs coordinate with each other to devise new strategies and to meet regional traffic demands, new issues and new perspectives on the role of the human in traffic management will evolve. These guidelines are intended to form a basis for further examination of future operator requirements and thus continue to support effective user-system design.

However, these guidelines are dated and do not meet current user needs. *A Requirements Analysis for Human Factors Guidelines for Transportation Management Centers* conducted as a pooled-fund study in 2008-2009 determined that an updated version of the guidelines would be useful. Overall, the requirements analysis received excellent support from pooled fund members and yielded a number of insights into the perceived need for human factors information dedicated to TMCs. Specific findings from end-users included:

- A TMC HG Guidelines Handbook is seen as a useful support document and reference by TMC pooled-fund members.
- TMC staff would like to see a number of design and operations topics included in the handbook.
- A structured, 2-page format with an emphasis on graphics is preferred.
- In the future, electronic versions of the document are viewed as essential by end-users

Suggested Approach:

Following the recommendations made in the *Requirements Analysis for Human Factors Guidelines for Transportation Management Centers project*, the next phase of this effort should include the following tasks:

- Prioritize topics and identify chapters targeted for completion in this phase through a survey of end-users
- Conduct detailed literature searches and develop summaries of research findings in key topic areas
- Develop annotated outlines for future guidelines
    - Should include: purpose of guideline, ideas for graphics, key references and findings, special issues
- Develop the TMC HF guidelines; develop and distribute draft versions, revise to

reflect TMC pooled-fund member comments and suggestions.

Products:
- Prioritized list of all chapters for the TMC HF Guidelines; list of chapters to be completed in this phase
- Summary tables of data sources and research findings for those topics/chapters to be completed in this phase
- Annotated outlines for those topics/chapters to be completed in this phase
- Draft and final guidelines for those topics/chapters to be completed in this phase

End Users (Product Customer):
Project team that will pull together *Human Factors Guidelines for Transportation Management Centers*.

Training, Outreach, and Distribution Plan:
None

Rough Order of Magnitude Cost:
Person Hours: _____
Labor Cost: $335,000
Direct Costs: $15,000
Total Cost: $350,000

Comments:
Sole source award. John Campbell (Battelle) to serve as principal investigator. John Campbell has extensive experience in project management and human factors guideline development.

In-Kind Support or Other Funding (Beyond SP&R):
-FHWA and pooled fund participants provide technical support and project management in the development of the project proposal, scope and product development.

Suggested Schedule for Major Milestones:
Prioritized list of all chapters for the TMC HF Guidelines; list of chapters to be completed in this phase, 4 months
Summary tables of data sources and research findings for those topics/chapters to be completed in this phase, 7 months
Annotated outlines for those topics/chapters to be completed in this phase, 11 months
Draft Guidelines, 16 months
Final Guidelines, 18 months

Benefits:
A handbook of TMC Human Factors Guidelines will provide TMC staff, supervisors, managers, and designers with a clear, relevant, and easy-to-use reference of human factors principles for TMC design and operation.

TMC Pooled-Fund Study 2009 Annual Meeting
Project Proposal Form

Project Category: Developing and Delivering Roadway and Travel Condition Information **Project Number:**

Project Title: Advance Travel Time Displays at Freeway Entrance Approaches

Statement of Problem:

Many transportation agencies now provide real-time travel time information to motorists via changeable message signs (CMS) on freeways. Research studies, including the TMC Pooled-Fund Study project "Driver Use of En Route Real-Time Travel Time Information," have found that motorists (particularly commuters) value this information. Despite the fact that motorists like to have this information, there is not much evidence that providing en route freeway travel time information actually has much influence on individual driver decisions or associated roadway system performance. Once committed to a freeway route, it is difficult to get motorists to divert. Current practice in providing travel time information generally makes use of existing CMS facilities on the freeway. The travel time information is typically provided when higher-priority messages do not over-ride them. The location of the travel time display is not necessarily optimal for supporting driver decisions and encouraging diversions from planned routes to make better use of system capacity. Travel time displays should have more influence on tripmaking if they are provided *prior* to the driver's point of commitment to a freeway route. Freeway entrances are often key choice points on a commute, where a driver commits to entering a freeway or remaining on a surface street route. In a FHWA study of commuter information needs, many commuters indicated that this was the *primary* daily decision point for them on their route. Commuters express frustration at the absence of better decision information at this key point. Examples of travel time displays on arterials in advance of a freeway entrance were found in the TMC Pooled Fund Study both in the U.S. and in foreign practice, but were not common. Although current practice on this is limited, existing implementations indicate that it is practical. There is no standard practice for such displays.

The objective of this proposal is to follow up on research and experience with en route travel time displays to provide agencies with a basis for more effectively using such displays to manage traffic and improve individual driver decisions. The intent is to quantify differences in motorist response (diversion rates, quality of decisions) to travel time displays at freeway approaches compared to displays located on the freeway itself. Examples of domestic and foreign practice (although limited) will be identified and reviewed, empirical research conducted, and recommendations provided. The possibility exists to take much greater advantage of intelligent roadside displays on the approach to freeway entrances, to support effective driver decision making. There are a number of important questions. What type of information should be supplied to drivers approaching a freeway to adequately meet their needs? How can this information be presented to allow adequate time for a decision while not promoting distraction? What are the operational factors involved in supporting such displays? How would such signs influence individual driver decisions, and what impact would this have on roadway network performance? These issues are the targets of the proposed project.

Suggested Approach:

<u>Literature Review and Summary</u>

- Identify and evaluate examples of current domestic and foreign practice with travel time and other dynamic traffic information displays on arterial approaches to freeway entrances. Review methods, technologies, performance.
- Review relevant human factors literature regarding en route information, CMS displays, and decision making
- Derive initial criteria and key unanswered questions for this application.

Evaluation of Travel Time Display Features for Arterial Approaches to Freeways

This task will determine the appropriate features of travel time displays for arterial approaches to freeways and compare the effectiveness of such signs to comparable signs located on freeways (typical current practice). The evaluation should consist of a mix of laboratory or simulator research and field testing of travel time-related displays on arterial approaches to freeways. The laboratory or simulator work should focus on display characteristics, such as information content, display format, sign placement, legibility, usability by motorists, etc. The field portion should implement arterial-based travel time signs along a commuter corridor at a cooperating site. Driver behavior, routing decisions/diversions, and roadway system performance, particularly when there are delays or incidents, should be compared to control sites. Local commuters who use the freeway system should also be surveyed regarding their use of the system and its perceived benefits. The methods, findings, and recommendations to be summarized in a technical report.

Research Report with Recommendations for Further Research and Technical Transfer

The report will summarize key findings and will provide guidance and recommended practices for providing real-time travel time information on surface road approaches to freeway entrances. This will include

- A listing of recommendations for further research, development, or testing
- A listing of recommendations for other initiatives necessary to facilitate the successful transfer and incorporation of the research findings and recommended guidance and practices produced in this effort into transportation systems management

Products:

- Literature review summary of research and practice, work plan
- Technical research report – summary of methods and findings, recommendations for CMS travel time displays in advance of freeway entrances, including information content, display format, and sign placement.
- Research Report – recommendations for further research and technical transfer

End Users (Product Customer):

- Personnel in state, regional, and local transportation agencies that are responsible for or involved with providing real-time en route travel information
- Research community

Training, Outreach, and Distribution Plan:

-Outreach and awareness as to the availability of the product through professional organizations.
-Publicized through FHWA Divisions, Resource Centers and related program activities.
-The products will be available via the Internet.

Rough Order of Magnitude Cost:	**Comments:**
Person Hours:	-Direct costs include limited funding to accommodate any interaction and review of practitioners on the development of this product and to obtain any available information from agencies via interviews and on-site visits to support development of case studies. -Support initial distribution of limited number of copies to each State DOT.
Labor Cost: $	
Direct Costs: $	
Total Cost: $300,000	

In-Kind Support or Other Funding (Beyond SP&R):

-FHWA and pooled fund participants provide technical support and project management in the development of the project proposal, scope and product development.

Suggested Schedule for Major Milestones: - 18 months
Benefits: